

# Existing Perceptions of Certainty, Risk, Uncertainty, and Risk Aversion

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Information Integrity/Integrity Information System/Management Information System

Course Lecture # 30

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**Lecture # 30:**  
**Existing Perceptions of Certainty,**  
**Risk, Uncertainty, and**  
**Risk Aversion**

# OVERVIEW - 1

- In search of I\*I where are we now?
- Nature of Risk
- Risk and Uncertainty
- Certainty, Risk, Uncertainty
- Nature of Decision process for Differing Outcomes
- How is Decision process under Uncertainty handled then?

# OVERVIEW - 2

- Uncertainty Avoidance/ Risk Aversion
- Risk Aversion is Costless to carry and has No Requirement for Information – Exact and Correct Information is assumed given
- Assumption of Knowledge of Exact and Exact Information
- Decision Alternatives Generated Exogenous to Decision Situation

# OVERVIEW - 3

- Decision process Outcomes Are Certain
- Exercises

# IN SEARCH OF I\*I

## WHERE ARE WE NOW? -1

- We have recognized that increased IT increases importance of integrity of information.
- As a result we are looking for analytical *information* economics model which helps us finding optimum I\*I value.
- Issue is that of individual vs. collective decision making and the EU theory is not useful for the purpose.

# IN SEARCH OF I\*I

## WHERE HAVE WE NOW? -2

- This implies need for developing alternate *information* economics model built for the process of individual decision situation, the concept of risk, the value of information and I\*I.
- This requires understanding existing perceptions of certainty, risk, uncertainty, and risk aversion (we shall deal with information value later)
  - Which in fact concern existing view of information economics, i.e., information *economics*.

# NATURE OF RISK

- Moving too quickly – out of control
- Risk from component (or system) failing to do its required function.
- Risk is a combination of frequency or probability of a specified hazardous event, and its consequence (severity).

# RISK AND UNCERTAINTY

- Information processing is a decision process. For our purpose, decision-process is same as a decision-making process and includes decision-maker.
- Decisions differ in a number of ways. One dimension of decision types, which is useful in information systems, is **knowledge of decision outcomes**. Three types of knowledge with respect to outcomes are usually distinguished.

# CERTAINTY, RISK, UNCERTAINTY

- o **Certainty:** Complete and accurate knowledge of the outcome of each alternative. There is only one outcome for each alternative.
- o **Risk:** Multiple possible outcomes of each alternative can be identified, and a probability of occurrence can be attached to each.
- o **Uncertainty:** Multiple outcomes for each alternative can be identified, but there is no knowledge of the probability to be attached to each other.

# NATURE OF DECISION PROCESS FOR DIFFERING OUTCOMES-1

- **Outcome states:**
  - **Decision-making under Certainty:** If the outcomes are known and values of the outcomes are certain, the decision process computes the optimal alternative or outcome. The optimising criterion may be cost.

# NATURE OF DECISION PROCESS FOR DIFFERING OUTCOMES-2

- o **Decision-making under Risk:** When only the probabilities of various outcomes are known; instead of optimising outcomes, the decision making process optimises the expected outcome. A basic assumption is that the decision is rational.

# NATURE OF DECISION PROCESS FOR DIFFERING OUTCOMES-3

- o **Decision-making under Uncertainty:** When outcomes are known but not the probabilities, decision process must be handled differently because, without probabilities, the optimisation criterion cannot be applied. Most suggestions for handling uncertainty are designed to supply the unknown probabilities. Some suggestions are: to assign equal probabilities, minimization of regret, application of game theory (maxmin and minmax criterion).

# HOW IS DECISION PROCESS UNDER UNCERTAINTY HANDLED THEN?

- By transforming the Decision Process under Uncertainty into that under Risk, i.e., by treating it as a special case of Decision-making under Risk.
- Thus there is no fundamental difference between the concepts of risk and uncertainty.

# UNCERTAINTY AVOIDANCE/ RISK AVERSION

- Organizations live in uncertain environments. The behaviour of the market, suppliers, shareholders, and government is uncertain.
- The behavioural theory of organizational decision-making assumes that the organization will seek to avoid risk and uncertainty at the expense of expected value.
- In general, the decision process will be willing to accept a reduction in the expected value of an outcome in exchange for an increase in the certainty of outcome.

**RISK AVERSION IS COSTLESS TO CARRY &  
HAS NO REQUIREMENT FOR INFORMATION  
– EXACT AND CORRECT INFORMATION IS  
ASSUMED GIVEN**

# ASSUMPTION OF KNOWLEDGE OF EXACT AND CORRECT INFORMATION

- Decision Processes under Risk and Uncertainty, like that under Certainty, are based on (the assumption of) having the knowledge of outcomes with certainty, i.e., (on assumption of) having **exact and correct** information about decision outcomes.

# DECISIONALTERNATIVES GENERATED EXOGENOUS TO DECISION SITUATION

- In other words, decision-making process is based on alternatives and outcomes generated exogenous to the decision situation.

# DECISION PROCESS

## OUTCOMES ARE CERTAIN -1

- These Decision Processes deliver the certain prospect even when expected values are same.
  - To accommodate this, these processes have to assume that every additional dollar brings less and less additional utility.
- Consider one such decision process, which has to choose between two prospects with equal expected value, the one certain prospect – say, \$ 1600 – and the other a lottery, contingent on a future “objectively probable” event, say a 40% chance of \$10,000 and a 60% chance of \$-4000.

# DECISION PROCESS OUTCOMES ARE CERTAIN -2

- The decision process has, *ex ante*, exact and correct information on which to base its choice of a prospect.
- In other words, the decision making process is certain that there is no way it can obtain additional information (by pushing system environmental boundary) and that it has all the information it needs to choose.

# DECISION PROCESS

## OUTCOMES ARE CERTAIN -3

- If the decision process chooses the lottery it will get what amounts to a decision situation with usability factor, denoted by  $\beta(I)$ , equal to zero, which means that it cannot be analysed as a decision situation at all: the decision process will be fatalistically indifferent and will not find it worth while to devote decision making resources and capacity to it. It is *not* a decision situation but a lottery.

# DECISION PROCESS

## OUTCOMES ARE CERTAIN -4

- Of course, aversion of decision process to lotteries may well affect its choice by it choosing certain prospect, but it will not affect its decision-making processes. In this sense, the “classical” risk aversion of mainstream economics is costless to carry, for the decision process, and causes no information demand.
- This explains why risk is taken to be the case where probabilities are given (as generated) “exogenously” or “objectively”.

# Exercises - 1

- (E11.1) Why are existing perceptions of certainty, risk, uncertainty, and risk the concern of information *economics*?
- (E11.2) What are the existing perceptions of certainty, risk, and uncertainty?
- (E11.3) Describe the processes of decision-making under certainty, risk and uncertainty.
- (E11.4) “Under existing perceptions of certainty, risk and uncertainty, which are functional in nature, i.e., post event, there is no fundamental difference between the concepts of risk and uncertainty”. Briefly elaborate.

# Exercises - 2

- (E11.5) What is the theory of uncertainty avoidance, i.e., risk aversion? What does it state? What is its implication for decision making?
- (E11.6) Under the existing perception, why is risk aversion costless to carry and has no requirement for information?
- (E11.7) “Under the existing perception, the decision process has, *ex ante*, exact and correct information on which to base its choice of a prospect. Thus decision process outcomes, which are generated *a priori*, exogenous to the individual decision situation, are certain. It experiences information technology risk but not I\*I risk. As a result, the decision process is fatalistically indifferent and does not find it worthwhile to devote decision

# EXERCISES - 3

making resources and capacity to decision situation by formalizing environment as a major decision making factor (for competitive advantage). It is *not* a decision situation at all”.

Elaborate with the help of example.

**THANK YOU**